WILLATS'S SCIENTIFIC MANUALS, No. I.

PLAIN DIRECTIONS

FOR OBTAINING

PHOTOGRAPHIC PICTURES

UPON

ALBUMENIZED PAPER AND GLASS,

BY

COLLODION AND ALBUMEN,

ETC., ETC.,

INCLUDING A SECOND EDITION OF

A PRACTICAL TREATISE ON PHOTOGRAPHY,

By GUSTAVE LE GRAY, of PARIS.

Also, a Supplement containing the

HELIOCHROME

Process, by M. Niepcé, de St. Victor.

PART II.

LONDON:

T. & R. WILLATS,

OPTICIANS AND PHILOSOPHICAL INSTRUMENT MAKERS;

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ALFRED BOOT, PRINTER, DOCKHEAD,
SOUTHWARK.

INTRODUCTION.

THE first part of this little work is dedicated to those processes on paper, which have been long before the public, together with such modifications of them as have been found to be improvements. In the second part, we propose to include those processes on glass, with gelatine and collodion, or on waxed paper, which are the result of the studies and experiments of experienced amateurs and professional photographists. These processes proceed in their main principles upon those already detailed, but the alterations and improvements which have been brought to bear upon them, have quite altered the character of the proofs obtained, and enable them successfully to rival the most beautiful specimens upon metal plates, the use of which will, perhaps, in future, be confined to portraiture, if it be not quite abandoned. The glass process as practised by M. Le Gray, M. Martens, and other French and English amateurs gives pictures as fine and distinct as those of the daguerreotype with less hardness, and with the inestimable advantages of having no metallic reflection, and being capable of reproduction to an almost unlimited extent. Artists, however, very much prefer the proofs from negatives taken on paper, which present the images of objects, with an exquisite blending of light and shade, and a softer outline, more in accordance with the appearances of nature.

It was the intention of the editor to have embodied in this second part, a reprint of the "Practical Treatise on Photography upon Paper,"

a first edition of which has already been sold, but the appearance of an entirely new work, by M. Le Gray and several brochures, by distinguished French operators, has induced him to translate all the essential portions of these rather than to reproduce an old work on which the author has greatly improved. The reader may rest assured that he has here, as faithfully rendered as possible, all that will be necessary for the successful practice of some very useful and interesting processes which have the merit also of being much more certain than those formerly used.

Assuredly, Photography on paper has made more progress in France than in England, a fact which is attributable, mainly, to the freedom of use enjoyed in the former country. It is there already employed for the purpose of illustrating books of travel, the first number, of a beautiful work, "Italie Monumentale," being now on sale. A printing office for the reproduction of positives in numbers is on the eve of establishment, and the government has just engaged several of the more skilful photographists to take views of the more interesting of the ancient monuments scattered through the provinces. The photographic Society founded by M. Le Comte Montfort, and the Journal "La Lumière" devoted to heliography, have done much to encourage and spread the knowledge and practice of this charming art. At some future day, when Photography is freed from its patents, if that day should ever come, we may hope to see it take the same high position in this country.

PHOTOGRAPHY ON GLASS, &c.

PART I.

M. LE GRAY in the introduction to his new work, after taking a review of the progress and present state of Photography, expresses his conviction that the chemical part of the science has little improvement to make, and that it is to the fabrication of the material on which the picture is to be impressed, that we must look for amelioration. He decidedly condemns glass tablets, as difficult to prepare, fragile, liable to peel off in taking pictures, embarrassing to the traveller, and as giving false ideas of light and shade. He concludes his remarks as follows:—"The future of Photography is altogether in paper; I cannot too strongly engage the amateur to direct to it his whole attention and study, and there can be no doubt that we shall shortly be able to obtain upon that material, all that can be desired in delicacy of execution and still greater artistic effect. Every one will agree with me that it is always more agreeable and convenient to have to take paper instead of glass, which is both heavy and fragile. It is for these reasons that I am compelled to think, that none of those precious results which can be obtained upon glass, will for one moment counterbalance the advantages of the processes on paper.

CHOICE OF PAPER.

The choice of paper is very important especially for the portrait, nevertheless with the new method which I am about to indicate this

choice is less important, and papers having little body, because of their extreme fineness, become excellent.

For operating without the preliminary preparation, I prefer for fineness of grain and solidity, Whatman's English paper, slightly glazed, of weight from 12 to 24lbs. per ream; for portraiture use the thin, and for landscape the thick.

Among the French papers, I use by preference those of M. Lacroix of Angoulême, and M. M. Canson, Frères of Annonay; those of M. Lacroix are the more rapid, but care must be exercised in the choice in order to have well-sized and close-grained paper. The greater rapidity of a paper depends on the presence of a considerable quantity of starch. I select the paper against the light, rejecting all the sheets that have holes, impurities, and above all stains of iron, which may be known by a yellow-rusty tint round them or by their metallic brilliancy. A paper bearing the impression of the mould should be rejected, as also that which is so much glazed as to appear full of small punctures, these become so many capillary tubes, by which the fluids penetrate the interior more abundantly than in other parts; when the re-action takes place, a crystalline deposit of gallate of silver is formed which stains the picture.

Having put aside all the sheets which present an even surface like that of ground glass, and having cut them half an inch larger each way than I absolutely require them, I prepare them in the following manner.

PRELIMINARY PREPARATION FOR THE NEGATIVE PAPER BY THE WET OR DRY METHOD.

The object of this preparation is to stop up all the pores of the paper by means of white wax, and to render it more apt to receive an equal re-action under the influence of the subsequent operations. The paper takes thus the appearance and firmness of parchment, and has the advantage of requiring no after-waxing in taking the positive proof.

To perform this operation take a large size daguerreotype plate,* place it upon a levelling stand, heat it by passing a spirit lamp under it, or, which is a better plan, by placing it over a water bath, and at the same time with the other hand rub a piece of white wax over the plate, which will melt. When there is a good coating of melted wax, place

* We have found a tin plate answer the purpose well.

your paper upon it, assisting its adherence with a card. When it has imbibed equally, withdraw it, and place it between several sheets of fine blotting paper, over which you pass an iron moderately hot, to take up the excess of wax. It is very essential that the wax should be very equally taken up and that none remain but in the texture of the paper. A well prepared sheet ought to have no shining places on its surface, when held against the light, and should be thoroughly transparent. The iron is hot enough when a drop of saliva boils without rolling off; a greater heat spoils the wax and stains the paper.

For this preparation, a very thin paper should be selected, those of Lacroix and Cansons Frères, of from 6 to 7 killogrammes the ream, are very good.

One of the principal qualities of paper thus prepared, besides that of permitting the least air bubble which might remain between it and the preparations to be readily seen, is, that of allowing the proof to develope itself for a considerable time in the gallic acid, without staining either the proof or the acid. I have left proofs three entire days without spoiling any thing. But its chief quality is, that it permits the paper to be prepared with the aceto-nitrate of silver before hand, and enables us thus to operate with a paper dry and remaining good for several days.

This preparation gives also very intense blacks upon very thin papers, when they cannot otherwise be obtained.

The bath of Iodide Potassium penetrates completely the wax, and takes away its greasy aspect by a sort of decomposition, which produces the effect of making all the preparations which follow, take very perfectly and equally. It is necessary to leave this paper from half an hour to an hour in the iodide bath, according to the thickness of the paper, in order that the wax may be thoroughly decomposed. The thicker the paper, the more time it takes to accomplish this; care must also be taken after the paper is dry, not to bring it near the fire, because then the wax would become greasy again, and prevent the nitrate of silver from spreading equally.

After the paper has been immersed in the iodide of potassium, it assumes a violet tint when completely dry.* This tint, which is produced by a combination of the wax with the iodide, instead of being hurtful, is, on the contrary, very useful, because it guides to the time necessary to

* We have not usually found this to be the case.

leave the paper in the silver bath; this time being just what is necessary to remove the violet colour.

The preparations which follow may be applied indifferently upon waxed paper or upon ordinary paper. In this latter case it is better to employ thicker paper.

In three litres of distilled water and in an earthen vessel boil 250 grammes of rice*; let the rice be only slightly broken, in order that the liquid obtained be not thickened by an excess of amidine, but contain only the glutenous matter of the rice. Turn the whole into a fine linen rag and preserve the liquor which comes from it. It is an excellent size, which gives body to the paper and very beautiful blacks. To prepare the first bath in which the paper is to be soaked, in order that it may contain the salts which should form the sensitive preparation under the re-action of the aceto-nitrate silver, you must dissolve in a litre of rice water above mentioned, the following substances:—

	Grammes.	Centigrammes.
Sugar of Milk	10	0†
Iodide of Potassium	15	0
Cyanide of Potassium.....	0	80
Fluoride of Potassium.....	0	50

When every thing is well dissolved, filter it through a piece of fine linen and preserve the liquid in a bottle to use as you require it. This preparation will keep a long time without alteration and serve to the last drop.

When you wish to prepare the paper, pour some of this solution into a large dish, and plunge your waxed paper, sheet by sheet, completely into it; the one upon the other, taking good care to avoid air bubbles.

Put thus fifteen or twenty sheets at a time, and leave them to soak from half an hour to an hour, according to the thickness of the paper.

Turn over the mass, then beginning by the first sheet immersed, hang them on a line to dry. By bringing near to the corner, from whence the liquid drops, a little piece of blotting paper, it adheres and facilitates the fall of the drops. You must take care never to mix together English and French paper in the same trough, but prepare them separately. English paper contains a free acid, which precipitates immediately an io-

* About three ounces to a quart.

† Rice water 1 quart, sugar of milk 11 drams, iodide potassium 4 drams, cyanide of potassium 12 grains, fluoride of ditto 8 grains.

dide of amadine in the French paper and colours it completely deep violet. The paper being dry cut it to the size of your camera, and preserve it in a portfolio. This paper being almost insensible to light, the preparation may be made in day light; nevertheless, a too prolonged exposure to a strong light will decompose the iodide of potassium, and precipitate the iodine upon the starch in the paper. I think it better, therefore, to keep it from the action of any strong light.

This paper may serve indiscriminately for portraits or views; it gives finely modulated tones and very intense blacks.

It is, however, if not waxed, less rapid than the paper I shall point out in the next section, and which is exclusively destined for portraits, but being waxed and dry, it rivals it in rapidity. The liquid which remains after the paper is withdrawn, may be put in a bottle and will serve for further preparations. It is sufficient to filter it before using.

You may, especially when paper not previously waxed is used, add to the solution the viscious residue of the whites of two eggs, beaten into snow for every litre of the preparation. I call the paper thus treated, iodized paper.

OF A PAPER SPECIALLY FOR PORTRAITS.

Make in a well stoppered bottle the following solution :—

	Grammes	Centigrammes.
Distilled Water	400*	
Iodide Potassium	20	
Cyanide ditto	2	
Fluoride ditto	0	50

Pour out some of this solution into a flat porcelain dish, or upon a glass made very horizontal. Take good French paper, that of Canson, 15 killos to the ream is best. Mark the inside, which is the side that has the appearance of cloth, whilst the outside is like satin. Take the sheet by two angles, the inside upwards, and apply the right side upon the liquid which is in the trough, beginning the immersion by the side which is nearest to you, and pushing the sheet before you so that it always falls at a right angle upon the liquid. This movement is repeated two or three times in order to exercise a pressure which shall drive out the

* Distilled water, 6½ oz., iodide potassium, 2 drs. 40 grs., cyanide potassium, 16 grs., Fluoride potassium, 4 grs.

the air bubbles which may be formed. Take great care that the liquid does not pass through the paper.

You will leave it about one or two minutes on this bath; then you take it up and dry it perfectly between sheets of very fine blotting paper, rubbing it with the hands in every direction. You must take care to change its place several times in order to remove the humidity equally.

After taking the sheet from the blotting paper, pass a soft brush over the prepared side to remove any impurities; then place the prepared side upon the bath of nitrate of silver which will be indicated in the following section, leaving it eight or ten seconds at most, and putting it immediately upon the slate or glass of the camera, which you will have previously covered with a sheet of blotting paper well saturated with water as I shall presently indicate.

It is necessary to use this paper immediately because its great sensibility depends, above all, upon the commencement of the formation of the iodide of silver upon which you operate. It requires in summer, four to ten seconds of exposure in the shade for a portrait, and in winter 18 to 40 seconds.

A little rapidity is gained by absorbing with blotting paper the aceto-nitrate of silver after the application of the prepared sheet upon the slate, but it requires dexterity and use to do this very equally.

MANNER OF GIVING SENSIBILITY TO THE PRECEDING PAPER.

Make in obscurity, or by the light of a taper, the following solution in a well-stoppered bottle.

Distilled Water . .	150*	grammes.
Nitrate of Silver . .	5	do.

When the nitrate of silver is dissolved, add

Acetic Acid . . .	12	do.

Care must be taken to keep the bottle containing this solution away from the light, and surrounded by a case of black paper.

These proportions are excellent for papers prepared in advance, and destined to be employed either wet or dry long after the time of prepara-

* Distilled water 2½ ounces, nitrate of silver 40 grains, acetic acid 1 dram 36 grains.

tion. It ought to be used but once when you wish to be sure of a good proof, consequently you must not put into the trough more than is necessary to cover the sheet to be prepared when you operate with wet paper.

If you operate with the preparation for portraits, or with waxed paper that you wish to employ dry, without preserving it, more than four days, it is better to use the following solution :—

Distilled Water	150†	grammes.
Nitrate of Silver	10	do.
Acetic Acid	12	do.

WET METHOD.‡

At the moment of taking a proof, pour a little of one of these solutions upon a porcelain or glass tablet. For this purpose I make use of a small tube to take up the liquid to avoid the pellicle which forms at the surface, and stains the picture irremediably. It is perhaps still better to filter the required quantity of silver through blotting paper.

For greater security you may pass a piece of white paper over the surface of the liquid in order to draw off the impurities which may remain before preparing the paper.

You take then a sheet of iodized paper by two corners, and place one side only upon the aceto-nitrate of silver—for the paper for portraits that side to which has been applied the first preparation. Raise and lower it several times so as to drive out the air bubbles. In order to avoid staining my fingers I have a long palette knife which I place under the corner of the sheet to hold it between that and the thumb.

Avoid, with the greatest care, letting the aceto-nitrate get upon the back of the paper; inequalities of sensibility would result, and consequently stains. Let the paper remain subject to the action of the aceto nitrate silver until the formation of the sensitive coating is thoroughly complete. This will take from one to five minutes with the ordinary paper prepared with sugar of milk, according to the temperature and the quality of the paper; English paper taking more time than French;

† Distilled water 2½ ounces, nitrate of silver 80 grains, acetic acid 1 dram 36 grains.

‡ For this method it is better to employ paper simply iodized without being previously waxed.

with the waxed paper it requires the time which will cause the violet tint to disappear, four to five minutes; with the negative paper for portraits eight to ten seconds at most will suffice, more time will reduce the sensibility. Then apply the paper, thus prepared, quite moist upon a slate, upon which you have previously stretched to receive it a sheet of unsized paper, well saturated with water. For this purpose I prefer the slate to all other colours because it has the property of preserving its humidity longer. As a matter of course, the prepared side must be outwards, and the paper beneath it must be free from all stains of iron. Care must also be taken to mark that side of the slate which is downwards in the camera, and always to keep it in the same direction, when put into the camera if not the liquid will collect there and produce stains.

The paper so placed may remain for three or four hours without loosening or becoming injured for use in the camera. When I am going far to take a picture, I steep the first sheet in gum water which retains the humidity longer, and is more adherent. You may make use of two glasses between which to place the prepared paper, but great precaution must be taken to keep the glasses very clean, and to repolish them when scratched. I use printing paper for cleaning glasses, troughs, &c., it is superior to linen and absorbs better the liquids and the impurities which adhere to them. I do not spare it, and prefer using a sheet too much to being uncertain about the cleanliness of my utensils.

When the paper which leaves the slate is very adherent upon the slate, it is well not to change it for every picture, it suffices to put a little fresh water upon it before applying a newly prepared sheet.

DRY METHOD.

I have come, by the aid of my waxed paper, to be able to operate with dry paper with the greatest certainty of success, and I have obtained thus complete results, superior to those obtained by the wet method, much finer and with as much confidence as in the camera. Even portraits, executed thus, succeed perfectly well, perhaps better than with the rapid method above referred to. It requires about twenty seconds to one minute of exposure in the shade; two or three seconds may even suffice in certain cases. It then requires much time to develope the image in the gallic acid, but the image will come equally well, only there will be a strong contrast between the blacks and whites. In this case it is

absolutely necessary that the gallic acid and aceto-nitrate silver that is added, should be new and extremely pure and filtered.

In operating, you take two porcelain troughs, rather deep; in the first you put some of the aceto-nitrate of silver solution, mentioned page 11; and in the second some distilled water.

You plunge the waxed and iodized paper completely into the nitrate of silver in the first trough, and leave it there four or five minutes, you then withdraw it and put it immediately in the distilled water in the second trough, where you leave it at least four minutes and longer if you wish to preserve the paper a long time before using it. You can prepare in the same baths ten sheets one after the other. At length you take the paper from the water and dry it between blotting paper very clean and new—placing it, to preserve it, between the leaves of a quire of the same paper, equally new and good. This paper must not be dried by suspension in the air, it would change and become quite black in the gallic acid, but it must dry naturally, as I have stated, between blotting paper, putting alternately a sheet of prepared paper and a sheet of blotting paper.

By keeping paper thus prepared from the light it will preserve its sensibility five or six days, or more, before exposure in the camera. In using the solution of aceto-nitrate, page 10, it may be preserved good 10 or 12 days, but it is less sensible.* This mode of operation is precious for travellers, since it dispenses with manipulations so difficult when one is away from home. It is sufficient to carry with one, slides furnished with prepared paper, and a portfolio shutting very closely with two divisions, in one of which is placed a reserve of prepared paper and in the other the pictures which may be taken. You take two or three proofs of the same view to be sure of having one good one. Only in the evening or even later on your return, you develope the image with gallic acid. It is better not to place more than one or two proofs in the same bath of gallic acid.

The time of exposure in the camera is not longer than in the wet method, it is perhaps shorter, only it requires more time in the gallic acid, to which is added fifteen or twenty drops of aceto-nitrate of silver, filtered and quite fresh.

However short may have been the time of exposure it must be well understood that you can always obtain the image by leaving the proof a

* The Editor obtained a picture in London on paper prepared 10 days previously in Paris.

relatively longer time in the gallic acid. It is my opinion that the image is formed from the first moment that the luminous rays reflected from the object lens, strike the sensitive paper. All amateurs of Photography should direct their researches in this direction, and seek a re-active to develope this image with power. To give an instance of this: I have taken the same view twice at the same time; to the first I gave twenty seconds in dull weather, in the shade; to the second fifteen minutes, while the result obtained was the same, only the first appeared but after a stay of a day and night in the gallic acid, while the second was completely out in an hour.

Since I have followed the dry method, I scarcely ever fail in a proof; therefore I most particularly recommend it. Amateurs may find, perhaps, in the beginning some difficulty in its use because it differs entirely from all the processes formerly in use, but with study and perseverance they will be convinced of all the advantages which it presents; and it will be, I hope, generally adopted.

The operator must not be alarmed by the dirty colour and spotted aspect of the paper under the gallic acid; when it is dry this appearance will totally disappear in transparence, when the wax contained in the proof has been melted again, by exposing the negative to a suitable heat. This precaution should never be neglected, it is indispensable to the quality of the proof and is superior to a fresh waxing.

Your operations finished, return the remaining aceto-nitrate of silver into a bottle, but do not preserve it for new proofs, which will be a constant cause of failure. This old aceto-nitrate contains albuminous colored matter in suspension which would produce stains and marbling over the proof. It may be made useful by pouring into it chloride of sodium, or a solution of common salt; you obtain thus a chloride of silver which serves to give to the hyposulphite of soda the quality necessary in order to obtain fine lines.

EXPOSURE IN THE CAMERA.

Obtain an exact focus upon your ground glass, seeking the greatest accuracy in the intermediate part between the fore ground and back ground which usually constitutes the principal point of the subject which you wish to represent, and which often comes out better by the sacrifice of the minor details.

There is a point where the image appears clear and distinct every

where; it is at this point that you must stop taking into account the thickness of the paper.

I cannot state exactly the time of exposure to the light, experience alone can determine it. Upon this time of exposure depends all the beauty of the image. I do not know how to impress this too much upon the attention.

For a portrait in the shade with the sensitive preparation, (page 11) and a double combination lens to cover the whole plate, I give between three seconds and one minute, and in the sun from one to ten seconds, and with waxed paper, employed dry, from fifteen seconds to a minute in the shade.

For views, with waxed paper dry, and the formula with sugar of milk only, with a full sized lens and a diaphragm of from fifteen to twenty millimetres in diameter, the exposure should be from thirty seconds to twenty minutes in the sun, according to its intensity and the season. The time should also vary according to the colour of the objects to be reproduced. Thus, for example, with an equal light, a monument will want thirty seconds of exposure, whilst forest trees will require perhaps twenty minutes for reproduction.

Heat is also a great cause of acceleration. Thus, by warming the slate which carries the prepared paper, you operate more quickly; but it is in that case necessary that the lens be heated to the same temperature, if not, it will be covered with vapours which will hinder the formation of the image. This often happens when operating in the sun, and care must be taken to warm the lens, and to wipe it carefully, the inconvenience may be lessened by placing a white handkerchief over the camera which will reflect the rays without warming the box. The exposure terminated, the image is scarcely apparent, and is only developed by the succeeding operation which can be performed one or two hours after with the wet paper, and even one or two days after with waxed paper used dry.

DEVELOPEMENT OF THE IMAGE.

The image is developed by the aid of gallic acid dissolved in distilled water. The proportion which I find the best is the following:—

Distilled Water	1 litre*
Gallic Acid	4 grammes.

* Distilled Water, 1 quart, Gallic Acid, ½ dram.

The saturated solution of gallic acid, formerly recommended, has the very serious inconvenience of leaving colored crystals in the interior of the paper proof by the evaporation of the liquid during the time of its being in the bath.

Pour some of this solution into a shallow trough, and plunge the proof completely in it so that it shall be entirely covered on both sides. Follow its development which is easily seen through the thickness of the paper. It must be left thus from ten minutes to an hour or two, and sometimes more until it has arrived at perfection.

With the waxed paper you may leave it one or two days without inconvenience, when the exposure has been very short, five or six seconds; for example. The action of the gallic acid is singularly accelerated by adding a few drops (15 to 20) of aceto-nitrate silver when the image begins to develop itself; by this means very intense blacks are produced, but then the action must be closely watched, because it is so rapid and gives such strong blacks that there is a risk of having them too powerful if the proper time be overpassed. When it is very vigorous, withdraw it promptly, and wash it in several waters, rubbing the back lightly with the finger to remove the crystaline deposits which might stain it. The grey tint assumed by the waxed proof during its stay in the gallic acid need cause no alarm; as a transparency this tint will disappear and leave the blacks and whites of a remarkable beauty. The tone assumed by the image under the gallic acid will enable you to judge if the exposure to light has been sufficient. If it become of a greyish black all over, examined by holding it against a taper, it has been exposed too long to the light.

If the high lights, which ought to be the deep blacks of the positive, do not become deeper than the half tints, the exposure has still been too lengthened. If, on the contrary, the exposure has been too short, the lights alone are feebly marked in black, and the image becomes at length uniform throughout. If the time has been suitable, a superb proof is obtained which ought to present well defined and clear contrasts of white and black.

A first proof will then serve to regulate the time of exposure in the Camera.

I accelerate this operation remarkably by heating the gallic acid. I have, for this purpose, a very simple apparatus. It is composed of a square basin in copper, full of water, kept at about thirty or forty de-

grees (cent.) of temperature by a spirit lamp: upon this I place my trough with gallic acid and so obtain a very even temperature. The image thus obtained is not permanent, but must be permanently fixed by the following operation, after having first washed it in water.

FIXING THE NEGATIVE PROOF.

Make in a bottle the following solution:—

Filtered Water . . .	8 parts
Hyposulphite Soda . . .	1 part

Put a small quantity into a trough and plunge your proof completely into it, taking care that there are no air bubbles.

The hyposulphite takes up all the salts of silver which remain unaltered in the proof, and, on the other hand, does not attack the gallate of silver which forms the blacks. Never put more than one proof at a time in the hyposulphite solution; you may, nevertheless, make use of it for many proofs, one after the other.

You may put the remainder of the hyposulphite into another bottle which has already served and let it repose; films of gallate and of sulphuret of silver will form, which may be separated by filtration, and the liquid becomes excellent for fixing feeble proofs.

If the proof is examined by transparence after it has been for some time in the hyposulphite bath, it may be thought to be spoiled because the iodide of silver which has a straw colour tint, being completely removed in some parts and remaining in others, forms stains which apparently annihilate the image. But if we wait until all the iodide of silver is removed completely, which will be known by the entire disappearance of the yellow colour, we shall be astonished at the whiteness and transparency of the paper, as well as at the beauty of the dark parts of the image. It requires, for this purpose, half to three-quarters of an hour, with the ordinary papers. A too prolonged stay in the bath will enfeeble the blacks of the proof, it is, therefore, necessary to watch this operation with some attention. With the waxed paper ten to fifteen minutes suffices for the fixing.

The proof must now be washed in several waters, and be left in a basin of water for half-an-hour, to disengage the hyposulphite. It may then be dried by suspending it from one corner.

The proof thus fixed is completely inalterable in the light, because there remains but the black gallate of silver in the paper.

I have negatives thus prepared which have already furnished me 200 and 300 proofs, and of which the last are as fine as the first.

The fixing by bromide, has not, on the contrary, this permanency, because that it does not thoroughly take away the preparations from the paper, and will itself alone give a very good proof with nitrate of silver in the camera; it is only less sensitive.

It may be, however, of great utility on a journey, and when several proofs must be made, one after the other, because it avoids contact with the hyposulphite whilst we are preparing the negative paper, which becomes spotted with the slightest touch of this salt.

All the proofs may, therefore, be placed together in the following bromide bath, and after that, immediately fixed with hyposulphite, when all the proofs are finished; or else they may be dried between blotting paper, and only fixed on the return from the journey, which succeeds perfectly well. Only they must not be waxed in order to draw the counter-proofs from them before the last fixing with hyposulphite of soda, nor must the wax be revived by the fire in the case of the dry waxed paper.

Water	1 litre.*
Bromide of Potassium . .	24 gammes.

In taking them out of this bath, the picture must be washed in several waters and and then dried.

They must remain in this bath about a quarter of an hour, if they, however, should remain two or three hours therein, it will not injure them.

WAXING THE NEGATIVE PROOF.

When the negative proof is feeble and the paper very transparent make the positives without waxing.

The proofs obtained on previously waxed paper ought not to be waxed again; they need only to be brought near to the fire, in order to give back to the wax that transparency which has been removed by the successive bath.

Before this operation, they are full of spots, which need excite no alarm, for they disappear by this operation, as I have already said.

When the negative is strong and fine, and that it has not been made on waxed paper, it must be made to imbibe pure wax which doubles the transparency and strength of the paper, preserving it, at the same time,

* 210 grains to a pint.

from the influence of the nitrate of silver, which may remain free on the surface of the positive paper.

The waxing may be managed as indicated for the preliminary preparation of negative paper, page 6.

PREPARATION OF THE POSITIVE PAPER,

Make first a saturated solution of chloride of sodium; common salt or better still hydrochlorate of Ammonia of this take one part by volume and add to it three parts of filtered water.

Put a small quantity of this solution on a slab; then make another bottle, containing distilled water, one hundred parts, crystalized nitrate of silver, twenty parts; pour a small quantity of this on another slab; have stout white paper cut the proper size, and free from iron spots and other impurities; choose the rough side and mark it with a +; place it on the bath of chloride of sodium, using the method recommended in the second operation, and leave it from two to four minutes; then dry it between several leaves of pink blotting paper, which I prefer to white, as I can see better if any particles of the blotting adhere to it, rubbing it with the hand, prepare three sheets in advance before putting on the nitrate bath, in order to ensure its being dry. You take the first sheet prepared, and with a badger brush you rub the prepared side to take off all the superfluous salt which might adhere to it; put the prepared side of this sheet down on the nitrate slab, and leave it while you prepare another on the salt slab; you then finally remove the prepared sheet and hang it by the corner to dry. If you leave the sheet for a short time upon the nitrate slab, you obtain for your picture a reddish brown tint; if, on the contrary, you leave it a long time, you obtain a blackish tint.

This preparation should be made in the dark, or by the light of a taper only; you must take care that the positive paper is very dry before you put the negative upon it, or it will spoil by spotting with the nitrate of silver.

It is better to prepare this paper in the evening, and use it the next day; if used immediately, well dry it: you must not prepare the paper more than eight days in advance, as time will blacken it, even in the dark, as well as exposure to light.

PRODUCING THE POSITIVE PROOF.

Place the negative proof upon the lower glass of the pressure frame

put upon it a sheet of highly glazed paper, then a sheet of the positive paper—the prepared side upon the clichè; then place above that, a sheet of black paper, and the second glass of the frame upon it; shut down the cover, which exercises a slight pressure on the glasses, to be sure that the contact is perfect.* I always take care to leave a border outside the frame both of the clichè and the positive paper, that I may judge of the action of the light. Expose the frame to the light of the sun in such a way, that the rays will fall perpendicularly upon the proof; you will judge of the progress by the border outside of the frame.

These are the different tints it will successively take;—greyish blue, neutral tint, violet blue, indigo, black, bister black, sepia, yellow sepia, yellowish red, greenish grey, always more and more powerful, until the oxide of silver is reduced to the metallic state.

When you arrive at the colour you desire, you must stop the process; for example, to have the proof of a black tint after fixing with the hyposulphite, you must stop the process at the sepia colour; and the parts which should form the whites, at the greyish blue, in order to repair the loss of colour it sustains by the application of the hypo. bath.

You thus perceive that I cannot fix the precise time for exposure to the light, as it depends upon the intensity of the clichè, and the colour of the proof you wish to obtain.

FIXING THE POSITIVE PROOF.

The positive proof thus obtained is not permanent; you must fix it directly by the following operation:—

Dissolve in a bottle hyposulphite of soda 100 grammes, or 1 part.

Filtered water . . . . . 600 ,, or 6 parts.

In another bottle dissolve five grammes of nitrate of silver 1-20th part in a glass or two of water; when well dissolved, you add to it saturated solution of chloride of sodium, until the white precipitate ceases to fall; allow it to repose a short time, and then decant the clear liquor, and gather the precipitate of chloride of silver which you dissolve in the other bottle of hypo.; by this means you obtain directly the black tints with the hypo. thus prepared. The older the hypo. is, the better; when

* I always put a sheet of paper, very transparent and waxed, or a sheet of paper glazed with gelatine, between the negative proof and the positive cliche. This in no way hurts the sharpness of the impression and preserves the negative from contact with the nitrate of silver, which might injure it.

it gets thick, you must add a fresh solution of hyposulphite alone, without the chloride of silver, the old containing an excess, which it has taken from the proofs already immersed in it. You must not filter it to take away the deposit, but only let it repose in a large bottle, and decant the clear liquid for use, leaving the sediment to be re-dissolved by fresh hypo.

By leaving the proofs a longer or shorter period in the bath, you can obtain all the tints from the red to the black, and clear yellow; with a little practice you will be sure to get the tint you desire. You must not leave a proof less than an hour in the bath, for it to be sufficiently fixed, and it can remain three or four days to obtain the sepia and yellow. by heating the hypo. I accelerate the operation, but must not then leave the proof for an instant to itself, as the rapidity of action is so great that the picture might be completely effaced.

By adding to the preceding hypo. solution 25 grammes (1-4th part) of liquid ammonia, I obtain pretty bister tints, and very pure whites; the English paper is exceedingly good for these tints.

I obtain also fine velvet-like tints by putting it (when taken out of the hypo.) upon a bath of sel d'or, using one gramme of the salt to one litre of distilled water, to which 5 grammes of nitro-muriatic acid have been added.

Fine yellow tints are obtained by placing the proof (if very vigorous) first in a bath of hypo. and then in a bath composed of one litre of water and 50 grammes of hydrochloric acid; washing it perfectly in water; liquid ammonia employed in the same quantity as last mentioned, gives remarkably fine tints.

When the proof is the colour you desire, wash it in several waters, and leave it two or three hours in a basin of water, until, touching it with the tongue, you perceive no sweet taste which indicates the presence of hyposulphite of silver; then dry it by hanging it up, and it is finished. The bath of hypo. may contain as many proofs as you please; but care must be taken to get rid of air bubbles, between the sheets which would otherwise produce indelible black stains. I use, to agitate the proofs, a long silk pencil, by the aid of which, I get rid of the defects formed upon them. The taking positive proofs requires great care and attention and must not be treated as a secondary operation. It is necessary to calculate the time, by the subject and effect you wish to produce. When any peculiar effect is to be produced, put only one proof in the bath at a time.

THE PREPARATION OF NEGATIVES UPON GLASS BY ALBUMEN.

This preparation is based upon the property which the albumen has, by the application of heat, to become completely insoluble.

It is to the Nephew of M. Niepce, of St. Victor, that we owe the application of this substance to Photography upon glass. It was he who first continued, in another manner, the experiments on glass made by his uncle, and arrived at satisfactory results. It is to his incessant efforts, and the frankness with which he published his discoveries that we owe the fine proofs obtained in the present day. The negative proofs upon glass are distinguished by a fineness approaching very near to those obtained by the daguerreotype.

For the re-production of engravings, pictures, sculpture, and landscape, the result is complete. The only thing to be still desired, for portraits is an increase in the celerity of the operation.

It is, nevertheless, to be hoped that, with the united concurrence of artists and amateurs who are at present occupied upon this subject, we shall succeed in diminishing the time necessary for exposure to the light.

It is desirable that every one should publish frankly the fruit of his efforts, and there will evidently result immense progress and improvement.

PREPARATION OF THE ALBUMEN FOR GLASS.

Take of the whites of Eggs, very fresh, 183 grammes, put them into a large basin and dissolve in the liquid—

Iodide of Potossium*. .	4 grammes.
Bromide of ditto . .	50 centigrammes.
Chloride of Sodium . .	50 ditto.

Beat this mixture in a large dish with a wooden fork, until it is reduced to a thick white froth, then let it repose all night; the next day decant the viscous liquid, which has deposed, and use it for the preparation of your glasses.

For this purpose take thin glass, or, what is much better, *ground*

* Iodide of Potassium . . . . 1 dram.
Bromide ditto . . . . 7½ grains.
Chloride of Sodium . . . . 7½ grains.

glass, on which the adherence is more perfect, cut it the size of your camera frame, and grind the edges.

Before applying the preparation to the glass take care to wash it well and wipe it dry with soft paper; place it then upon a sheet of white paper and polish it perfectly with a piece of cotton, avoiding touching it with the hands.

The success of the proof is, in a great measure, due to the evenness of the coat of albumen, and the clearness of the glass.

To obtain this, place one of your glasses horizontally, upon a fixing stand assuring yourself that it is on a level by a little water, and then pour on it an abundant quantity of the albumen; then take the glass in your hand and incline it gently every way, that the coating may be even; then inclining it to to one corner pour off all the remainder of the albumen, so that there may remain only a very thin layer. Wipe the borders of the glass carefully with soft paper, and replace the glass upon the stand to dry, keeping it from the dust by the assistance of a card suspended above it.

At the moment of giving the bath of aceto-nitrate of silver, which is the same described under the second operation of negative paper (page 11); you expose your glass before a moderate fire, so as to take away completely every trace of humidity. This operation is very delicate, because the least stoppage in its immersion in the bath, will operate on the sensitive coating, and cause irregularities which nothing can remedy.

To obtain this instantaneous and regular immersion, I make use of the following apparatus, composed of two glasses, between the borders of which are cemented two bands of glass of two centimetres wide, and one between the two of one and a-half centimetres, so disposed as to form in the middle a groove into which the plates to be prepared may easily be passed. The best cement for the purpose consists of two parts of albumen, and one of white cheese, to which is added lime until it is of a proper consistence. When the cement is dry, fill the instrument with vinegar, which will coagulate the albumen, and render the cementing perfect. This apparatus has the form of a daguerreotype box, with only one groove. You pour into this box the two thirds of aceto-nitrate silver (page 11) and you let the glass slide into it with a single movement, taking care that there shall be no stoppage. After having left the glass to soak two or three minutes in the bath you withdraw it, and wash it perfectly with distilled water, then leaving it to dry in a complete obscurity. The

glasses thus prepared will keep one or two days before being exposed in the camera. You develop the image as that of negatives on paper, by putting it into a warm bath of gallic acid, containing, at most, one-tenth in volume of aceto-nitrate silver.

It requires one or two hours, or even more, to develop the image. When it is well out, fix by the method already indicated for paper (page 17).

To obtain a positive proof, it is sufficient to apply on the negative proof a sheet of common positive paper, or better still, a sheet of positive albumen paper, which I will describe hereafter.

You then put it in the pressure frame, placing above it a piece of black cloth pasted on one side of a thick sheet of glass; then shut the frame, giving to the proof a slight pressure; after which, expose it to the light. In order to follow its action, you may just raise it by one corner of the glass, to judge of the tint which the image takes; when you think it sufficiently exposed, take it out of the frame and fix it the same as the positive paper.

PREPARATION OF ALBUMEN PAPER FOR THE NEGATIVE PROOF.

The same preparation of albumen and the same quantities apply also perfectly upon paper, but it requires great caution to have it equal.

The proof that is thus furnished is remarkable for the depths of its blacks and transparency of its lights; almost all papers, when they are not too much spotted with black points, will serve by this method and give good results.

I obtain also a delicacy of execution which is almost as well defined as the proofs on glass, and which is incontestibly more artistic. Pour the solution into a dish, placed horizontally, taking care that there is no froth; then take the paper that you have chosen, and wet it on one side only, beginning at the edge of the dish which is nearest to you, and the largest side of the sheet, placing the right angle on the liquid, and inclining it towards you; advance it in such a manner as to exercise a pressure which will remove the air-bubbles. Place before you a light so as to be able to perceive the bubbles and to push them out if they remain.

Let the leaf imbibe for a minute at most, without touching it; then

take it up gently, but at once, with a very regular movement, and hang it up by the corner to dry.

You prepare thus as many leaves as you wish in the same bath, taking care that there is always about a quarter of an inch in depth of the solution in the dish; then place your sheets (thus prepared and dried) one on the other between two leaves of white paper, and pass over them several times a very hot iron, taking out a leaf each time; you will thus render the albumen insoluble.

The iron should be as hot as it can be without scorching the paper.

Then make use of this negative paper exactly like the first paper named, only great attention must be observed that the immersion in the aceto-nitrate bath is instantaneous, and that the air-bubbles are immediately driven out; for every time you stop, you will make stains the same as on glass. It is also necessary to heat moderately the gallic acid.

One of the best services rendered by the albumen to photography is, without doubt, its application to the preparation of the positive paper to which it gives a brilliancy and vigour difficult to obtain by any other method.

PREPARATION OF ALBUMEN ON POSITIVE PAPER.

Take white of eggs, to which add the fifth part, by volume, of saturated solution of chloride of sodium, or what is still better hydrochlorate of ammonia; then beat it into a froth, and decant the clear liquid after it has settled for one night.

Pour out the liquid into a basin, and prepare your positive paper on one side only, by the same method as in the preceding chapter or negative paper; dry it and pass the hot iron over it in the same manner as directed.

The paper thus prepared is very highly varnished. If you desire to obtain less gloss, add, before beating the eggs, the half or more of distilled water containing equally a fifth of water saturated with hydrochlorate ammonia. You may thus modify at pleasure the degree of brilliancy of the proof. The mixture of half albumen and half water is excellent, it gives much fineness and firmness without giving the proof a varnished appearance little in artistic.

You may keep this paper some time before you apply the nitrate of silver to it, as it does not spoil.

When you desire to use it, put the albumen side on a bath of nitrate of silver, containing one part of nitrate by weight, to four of distilled water, and let it imbibe four or five minutes; then hang it by the corner

to dry, and finish it as I have already described in the first positive paper.

This paper gives much depth to the blacks, and great brilliancy to the whites. In leaving it a shorter time on the nitrate bath (about one minute), and using Whatman's paper, you may obtain a reddish purple tint very harmonious. Canson's papers, and usually all those which contain much amidine, give black tints.

OBSERVATIONS RELATIVE TO OBTAINING VIEWS.

When you desire to take a view, be careful not to make the image too large, and that your perpendicular lines are true.

The distance from the object to be copied should be about one quarter of the whole scene, if you would obtain a picture free from any distortion.

When you wish to take the whole scene with a single lens, it is better to employ the half-plate size.

It is also well to get conveniently near to the object to be copied, as it requires a longer time in camera when the distance is great: vegetation and other green objects generally require a longer exposure.

Care must be taken that the sun's rays do not strike upon the object glass of the camera when taking a view, as it would interfere with the clearness of the image.

When you wish to operate in the country, it is quite necessary to take with you every thing you may require for use.

The following list of articles compose my travelling apparatus:

Camera and Lens.

In the interior of the Camera I enclose five bottles containing solu tions as under:

Aceto-nitrate of silver, saturated solution of gallic acid, distilled water, a solution of bromide potassium to fix the proofs provisionally, hyposulphite of soda, one pipette, three funnels (one in the other), three very shallow basins of porcelain, sunk in a box of walnut wood, and covered with ground glass, so contrived as to keep it air tight.

In one basin I place my lining paper already wetted.

In the second I have my negative proof in the solution of bromide. In the other I have water in which to place my proofs when sufficiently fixed, and leave them until I return home to finish with the hyposulphite of soda.

There should be only sufficient liquid in the basin to permit the leaves to adhere to the bottom, and no more, as they might be injured by slipping about in the journey.

I take also two glass slabs, one for the aceto-nitrate, and the other for the gallic acid. A tripod to keep the basins level, a portfolio containing the prepared paper, two or three quires of blotting paper to clean the slabs. A tripod stand to place the camera upon, also a stout black cloth, sufficiently large to cover completely the machine, and so arranged as to form a kind of tent, under which to make all my preparations; in case of wind, I fix the cloth to the ground with pegs. In one side of the tent I have an opening a foot square, covered with yellow stuff, which permits sufficient light to enable me to conduct the various operations. I have rings round the bottom to fix it with pegs if the wind is high. The box which contains the apparatus serves me for a table.

With the dry paper the baggage required for taking views is very much simplified; it suffices to take the camera, the stand, the tent, a box full of prepared paper, two porcelain troughs, a bottle of gallic acid, one of aceto-nitrate of silver, one of bromide potassium and one of distilled water. Even then troughs and bottles may be dispensed with, and even the proof may wait a day or two after exposure in the camera before being brought out.

For longer journeys I have another box which encloses twenty small square bottles in which I put the chemicals. A larger well-made box containing ten or twenty pounds hyposulphate soda. Three or four troughs large enough to make baths for the papers. A small balance with weights and a copying frame.

List of Chemicals necessary:

White Wax
Iodide of Potassium
Bromide of Potassium
Bromide of Ammonia
Chloride of Sodium
Crystalized Nitrate of Silver
Crystalizable Acetic Acid
Crystalized Gallic Acid
Hyposulphite of Soda

Liquid Ammonia
Hydrochloric Acid
Collodion
Spirit of Wine
Cyanide Potassium
Sugar of Milk
Hydro-chlorate of Ammonia
Distilled Water
Cyanide of Potassium

N.B. The Cyanide of Potassium is a very active poison, and should be employed with great caution; you may use it to remove stains made on the hands by the nitrate of silver, using about one gramme of the salt to ten of water, especially guard against chaps or cuts in the flesh.

THE LENS, OR OBJECTIVE.

The choice of a good lens is of the utmost importance for obtaining fine proofs. For the re-production of landscapes and monuments, the single lens is superior, to obtain the whole in good proportion, the focus should be of considerable length.

For portraits, a double achromatic lens is necessary. These lenses give excellent results, but centralize the light a little too much, it is this centralization which causes them to be more rapid in operation than others.

In choosing a lens, select one that gives the image clear to the edges of the ground glass, and do not attach too much importance to its rapidity of action; the image is better when it presents a clear aspect generally, than when it is very clear in the centre, and becomes gradually indistinct towards the edges. It is also necessary to be well assured that the chemical focus coincides with the visible focus.

I have found the French lens of Messrs. Lerebours and Secretan answer perfectly, I use no other kind for my portraits. Those for the half-plate are remarkable for their clearness and rapidity, and I recommend the amateur to purchase one of eight centimetres in diameter, it gives remarkably fine portraits; and by adapting a diaphragm the whole plate may be employed. With a single lens for landscapes and monuments, and a double one for portraits, the amateur will have all that is requisite. If you wish to have the landscape very clear, use the diaphragm.

The above combination I use daily with great success. I have a double French lens for the normal plate, composed of two-glasses of eight centimetres, which serves me for large portraits, and a single lens for monuments. I sometimes add to the first, the single lens, the convex side of the glass towards the interior of the camera; and by this addition I obtain an image on the half-plate excessively luminous, and a very short focus that gives an extraordinary rapidity, producing a portrait in ten seconds in the shade. For this I have a tube of twelve centimetres long, which slides upon the double lens, and at the extremity screw on

the single lens, I choose the distance according to the dimension of the picture I wish to obtain, the glasses above named are all that is requisite to operate at will, under any circumstances, successfully.

OBSERVATIONS UPON THE EXECUTION OF PORTRAITS, AND THE RE-PRODUCTION OF DAGUERREOTYPES AND OIL PAINTINGS

Tasteful effect is one of the most indispensable conditions for an agreeable portrait, and the amateur should neglect nothing to obtain it.

The model ought always to be placed in shade, and one side a little more illuminated than the other. It is great want of elegance to place the head in the same position as the shoulders; if the face is full, the body should be placed three quarters round, and *vice versa*.

The light obtained from a very large window is good for the execution of portraits, care should be taken to place before the window a white screen; to project reflected light upon those parts that are in shade; without this precaution we obtain too sudden a transition from light to dark, which is not harmonious. A mirror so disposed as to convey the reflected rays upon that part of the figure in shade, gives also a very beautiful effect. The model should thus be placed between the direct rays from the windows and those reflected by the screen or mirror.

The exterior diffusion of light is good, as it assists the rapidity of action, but in this case it is presented to one side of the model only, leaving the other in very deep shade, and without the assistance of reflected light the effect would be entirely destroyed.

In pointing the camera be careful to have the face very clearly defined upon the ground glass. When a portrait is taken in a sitting posture, the knees and the hands are generally too forward to be in focus with the face; to overcome this difficulty, I have the slate that holds the plate at the back of the camera curved. To obtain this curve I place a person in a chair, the hands and knees in the most habitual position, then calculate, upon ground glass, the difference in length of focus between the hands and face; this difference being established, I make the curve of the plate to correspond with the place of the image. The place occupied by the head should be scrupulously the same as upon the ground glass, and the curve arranged only for the part out of focus. I have

found the proof come out perfectly clear in all points by adopting this method. A dark drapery should also be placed before the model to repose the eyes upon, as it is less fatiguing to the sight than light colours; place a spot on that part upon which the eyes are to rest, requiring the lids to be kept in the most habitual position. The eye should not be fixed with intense regard upon the spot, but with a degree of freedom, otherwise it will become suffused with tears, and by the effect of nervous contraction the portrait will become distorted.

I have met with much success in copying daguerreotope impressions upon paper; for this purpose, I adapt my single lens to a camera, from fifty centimetres to one metre of focal length, then cover the front of the camera and lens with black cloth, leaving only an opening the size of the diaphram; by this means, remarkable intensity in the blacks of the proof may be obtained, and the reflection of the camera in the plate be avoided.

The light should fall upon the plate by oblique rays, and in such a manner that they never reflect at a right angle into the camera.

The image may thus be obtained equal to, or double and treble the size of the plate to be copied.

The same precaution should be taken in oil paintings.

To copy a plate the same size or larger requires a much longer exposure in the camera, from a quarter to half an hour, according to the size.

When I take a portrait sitting, the knees and the hands always come a great deal too much in advance to be nicely in focus. I succeed, however, by employing a slate curved towards the top of the camera.

To obtain this curve, I place a person on a chair, his hands on his knees, in the most habitual position. I calculate upon the ground glass the difference existing between the length of the focus, of the face and that of the hands; this difference established serves to make the curveture of the slate at the corresponding place of the image.

The place which the head occupies must be scrupulously kept at the same point, as the ground glass of the camera, it is put exactly on the point above, without troubling ourselves about the hands, which are in the proof perfectly clear by the lengthening of the focus, produced by the curveture of the slate.

I manage also before my model a black cloth, upon which he can rest his eyes without fatiguing them; I put a wafer on the place he ought to look at, and bid him to move his eye-lids as usual.

Care must be taken to avoid a complete fixedness of look, in a mo-

ment's time the eyes would fill with tears, and the whole picture would give an absurd look from the effect of the nervous and uneasy contraction that it would produce.

Mr. Le Gray concludes his pamphlet with the following observations:—

I have endeavoured to give in this little treatise, all I considered would be useful to the amateur for success in his pursuits; discouragement must not follow from want of success at first, observe exactly all the directions given, difficulties will be surmounted and success certain. Every day I am practically engaged in this art at my Photographic Rooms, No. 7, Chemin de Ronde de la Barrier, Clichy, and shall be most happy to give, personally, any further information or assistance, and to exhibit my extensive collection of specimens produced by this process.

PHOTOGRAPHY ON GLASS, &c.

PART II.

PROCESS ON GLASS WITH COLLODION.

This new process, which promises to be as useful as it is simple and beautiful, is especially adapted to portraits. By the kindness of several friends we are enabled to give very complete instructions which we know will enable the merest tyro in photography, with only ordinary care and attention, to succeed.

It is difficult to say who first proposed the use of this substance, but certainly to Mr. Fred. Scott Archer, is due the merit of having first described the method of applying it. His communication to the "Chemist," dated 18th February, 1851, is as follows:—

The imperfections in paper photography, arising from the uneven texture of the material, however much care may be taken in the manufacture of it, and which from its nature, being a fibrous substance, cannot, I believe, be overcome, has induced me to lay it aside and endeavour to find some other substance more applicable, and meeting the necessary conditions required of it, such as fineness of surface, transparency, and ease of manipulation.

A layer of albumen on glass answers many of these conditions, producing a fine transparent film, but it is difficult to obtain an even coating on the glass plate; it requires careful drying, and is so extremely delicate when damp that it will not bear the slightest handling; besides these objections, the necessity of having a large stock of glass when a number of pictures are to be taken, is much against its general use. My endeavor, therefore, has been to overcome these difficulties, and I find, from numerous trials, that *Collodion*, when well prepared, is admirably adapted for photographic purposes as a substitute for paper. It presents a perfectly transparent and even surface when poured on glass, and being in some measure tough and elastic, will, when damp, bear handling in several stages of the process.

I will now give a short outline of my mode of using it. The first

step in the process is to prepare the solution of collodion. There are several ways of doing this, but I will briefly allude to two.

Pour a quantity (say 1 oz.) of collodion into a bottle containing dry iodide of silver to settle. The collodion will, in this way, take up a certain quantity of the silver salt, and become opaque; it should then be transferred to another bottle containing iodide of potassium, to be again well shaken up until the iodide of silver is entirely dissolved, and the solution becomes perfectly transparent.

Or this:—To a solution of iodide of potassium in spirits of wine, add a small quantity of iodide of silver sufficient to saturate the iodide of potassium; let, however, the latter salt be in excess. Add a small quantity of this solution to the collodion, between five and ten grs. by measure to 1 oz. of collodion will be sufficient, and if any of the iodide of silver should precipitate, a small quantity of iodide of potassium must be added to dissolve it. In this way, or by the former mode, the collodion may be prepared.

The next step is to spread this solution evenly on a plate of glass. This can be done by pouring a sufficient quantity on the glass to run in a body freely. When it has entirely covered the glass plate, let the superabundance be drained off at one corner into the bottle again; this operation cannot be done too quickly, for the ether rapidly evaporating would prevent the collodion running evenly over the surface of the plate, and becoming too thick.

The plate is now plunged into a bath of nitrate of silver, allowed to remain there for a few seconds, and then washed in water. (This washing is intended to remove all the ether from the surface of the collodion, which, if allowed to remain, would cause an unevenness in the sensitiveness of the surface, producing streaks or spots.) Immediately after washing, it may be exposed to the action of light for the time necessary to obtain a picture. This picture can be developed either by gallic or pyro-gallic acid. If the latter acid be used, a few precautions are necessary, to which I will allude presently. The former acid may be used as a bath, in the ordinary way. After the picture is developed, the film of collodion should be loosened from the edges of the glass plate with a flat glass rod. By doing this, it will easily separate from the plate and can be allowed to float freely in the water bath, previous to being placed in the bath of hyposulphite of soda, and then again thoroughly washed.

The drawing can now be mounted on a plate of glass, and when dry can be varnished, to protect it from injury.

If thought more convenient (and, in fact, this mode is the best when pyro-gallic acid is used), the film of collodion, after being exposed to light and the image developed, can be removed from the glass plate (leaving the fixing and final washing to be done at leisure) by rolling it up on a glass rod, thus :—Take a sheet of ordinary white wrapping or thick blotting paper (if glazed it will be better), about the same breadth, and about one-third longer than the drawing to be removed, soak it in water, and place it with the glazed side in contact with the surface of collodion. Turn the end of the collodion picture over the edge of the paper lying upon it, then place the glass rod just within the edge, and commence rolling it upon the rod; with a little dexterity, this can be accomplished without injuring the drawing. The cylinder thus formed, is easily removed from the glass rod, and can be preserved for any length of time in this state by being kept damp and away from the light, to be finally fixed at some more convenient time. Thus one plate of glass will be sufficient to make any number of drawings upon, the above operations being repeated for each picture.

The plate of glass should be rather larger than the drawings intended to be made upon it, to allow for rough edges, &c. The back of the glass may be ground to get the focus upon, and one side should be formed into a kind of handle to prevent the hand of the operator being near the solution when the glass is in use.

Thirty grains of nitrate of silver to one ounce of water will be sufficient for the nitrate of silver bath.

Three grains of pyro-gallic acid to one ounce of water, to which must be added about one drachm of acetic acid.

Between five and ten grains of nitrate of silver to one ounce of water.

The two latter solutions are to be mixed in equal proportions when a picture is to be developed. A wide-mouthed glass measure will be necessary to hold this mixture.

I have found it convenient to have a trough made of gutta percha, the two sides and bottom of which are about one-eight inch high and just large enough to hold the glass plate. With this trough the mixed solution can be poured rapidly over the plate, without fear of any being thrown over the edges.

Mr. F. Horne, in a communication to Mr R. Hunt, published in the "Art Journal," gives some further direction for the use of Collodion; the following is an extract.

Collodion, as most people are aware, is a solution of gun-cotton in ether, and, for the purpose now under consideration, should contain a small quantity of iodide of silver, dissolved in iodide of potassium. It should be sufficiently limpid to run freely over a plate when poured on, or ether must be added until this result is obtained. If the collodion be too thick, great difficulty will be experienced in obtaining an even coating, but when of a proper consistency, plates of any size may be coated. The plan which I have adopted, and with great success, is as follows:—Take a piece of flat glass, cut to the size of frame, and having washed it with water, and wiped the same quite dry, then, while holding it at one corner, or, if large, placing it on a levelling stand, pour on the centre of the plate a good body of the prepared collodion, which will readily diffuse itself equally over the surface. Immediately pour the liquid off again into the bottle from one corner, and by bringing the hand holding the plate down a little, that the liquid may run to the lower edge, and drawing the mouth of the bottle along; those lines first formed will run one into the other, and give a flat even surface Very little pratice will soon enable any operator to obtain this result. The plate is now immediately, and before the whole of the ether has had time to evaporate, to be immersed in a bath of nitrate of silver (thirty grains to the ounce of distilled water), until the greasy appearance which it first presents on immersion is entirely gone and the silver solution flows freely over the surface, and in its moist state be placed in the camera and the picture taken, the time of exposure varying of course with the light, but for a portrait and with a moderately quick lens from three to thirty seconds will be sufficient. Mr. Fry, with the Collodion, has obtained beautiful portraits by placing the sitter in the open air, and simply removing the cap from the lens and closing it again as soon as possible. The agent for developing these pictures is the pyrogallic acid, as recommended by Mr. Archer, and I am told the proto-nitrate of iron also answers equally well. The solution of pyro-gallic acid should be made as follows:—

Pyro-gallic acid . . .	3 Grains.
Glacial acetic acid . . .	1 Dram.
Distilled water . . .	1 Ounce.

The plate, after being exposed in the camera, is to be placed face upwards upon a levelling stand, and a sufficient quantity of the above solution should be poured equally and quickly over the surface, and the picture allowed to develop, occasionally moving the plate to prevent any deposit from settling at one spot. A few drops of a solution of nitrate of silver, five grains to the ounce, may also in dull weather be added to the pyro-gallic with advantage, just before pouring it over the plate; but in very bright weather the picture will develop sufficiently quick with the pyro-gallic acid solution alone. The development may be readily judged of by holding a piece of white paper occasionally under the plate, and as soon as sufficient intensity has been obtained, the solution must be poured off, and the plate washed by a gentle stream of water; after this the surface should be covered with a saturated solution of hyposulphite of soda, which will almost immediately remove the undecomposed iodide and fix the picture, and another stream of water must then again be poured over to free the plate from hyposulphite and the picture is finished.

In this state they are more or less negative by transmitted light, and if not too much brought out, positive, by reflected light. But I hav found the most beautiful and decided positives may be obtained by th simple addition to the pyro-gallic solution of a minute quantity of nitr acid, care being taken not to add too much; I have also obtained purp and green pictures; the former, by adding acetate of lead, and the latte with acetate of lime with ordinary gallic acid.

The pictures thus obtained may be treated as negative pictures, a printed from by any of the methods employed to obtain positive pictu from paper negatives.

From a friend, whose beautiful positive proofs on glass have ex ted much admiration, we have received the following communicati which we print entire.

POSITIVE PHOTOGRAPHS ON GLASS.

"I believe Le Gray was the first to mention, the use of collodion photography.*

"A fuller account of this method of proceeding is given by Mr. Arch in the 'Chemist' for March last. Neither of these gentlemen, howeve

* See Appendix, 1st Edition of Le Gray's Photography, August, 1850. T. & R. Willats.

allude to the production of *positives*, by this process, although it is certain that by Mr. Archer's method, indications of positive figures are given.

"The practice of taking pictures in the camera by means of the solution of collodion on glass is so simple, so easy in execution, and so rapid in its results, that there is little doubt, not only that the use of paper will be abandoned, but that Daguerreotypes will give place to positives taken by this means, which are less expensive, more correct (as by viewing the picture *through* the glass the proper position of objects is got), and *at least* as sensitive.

"As the manner in which I operate is different in some respects from any which I have seen published, and as by it positives of great beauty are produced with less exposure in the camera, than by any other method I have heard of (excepting Mr. Talbot's instantaneous process), it may be interesting to your readers to have some account of it:

"I use the collodion as recommended to be prepared by Mr. Archer, to this I add one grain per ounce of arsenious acid; a very little bromide of potassium also seems to have a beneficial effect.

"The glass plate (which should have the edges ground), when coated with this solution is placed *whilst wet*, upon a solution of nitrate silver 100 grains to 1 ounce of water, in which eight grains of iodide potassium have been dissolved.

"This salt when added, at first precipitates iodide of silver, but the precipitate is re-dissolved in a short time; its use is to saturate the solution of nitrate-silver with iodide silver, so as to prevent the dissolution of the coating of iodide of silver, which is formed on placing the coated plate in the dish containing the solution of nitrate-silver, and which immediately, in being formed, commences to re-dissolve in the nitrate-silver, unless protected by the saturation I have described. It is, in fact, impossible to produce satisfactory results, especially with strong solutions of nitrate-silver, unless this plan be adopted.

"The plate, after remaining some ten or twelve seconds, or until the trickling appearance caused by the ether has disappeared, is then placed vertically for a second or two, with one corner resting in the solution of nitrate-silver, so that the superfluous solution may drain off. It is then put in the camera.

"When taken out of the camera, it is breathed upon to dissipate any remaining ether, which prevents the equal flow of the developing fluid, and then, a solution of sulphate, or of nitrate of protoxide of iron,

twenty grains to six ounces of water, is gently poured on at one corner, so as to flow over the plate in not too great a quantity.

"When the object is sufficiently visible, it is stopped by dipping in water, and brought out still further by washing with hyposulphite soda, which removes the coating of iodide silver, where it is unacted on by light, the hyposulphite must be washed off entirely, and the picture dried (gently brushed over with a camel's hair brush) and varnished by mastic varnish dissolved in spirits of turpentine. This coat of varnish brings out the picture in its original brilliance, which the drying has caused it to lose.

"By this method, pictures of moving objects can be got, vessels sailing, the waves of the sea, and men and animals walking. In bright sunshine, and with the solution of nitrate silver and the developing solution warmed to 90° or 100°, it is impossible to open and shut the camera sufficiently quickly, and some other method must be adopted than the usual slide, which is quite unfit: in my camera, a spring is made to throw down a door in front of the plate, which door is immediately drawn up again by a thread,—but I would suggest some contrivance for sliding one stop over another, so that the two holes shall correspond only for a moment.

"Portraits are readily taken in four or five seconds, without sun and in rooms in about thirty seconds.

"For taking landscapes and fixed objects, especially where there are large masses of shade, it is desirable to employ the solution nitrate-silver, and the developing solution, much weaker,—fifteen grains nitrate-silver to one ounce water, and four or five grains sulphate-iron to one ounce water are sufficient, and the picture when brought out by the hyposulphite soda scarcely needs varnishing.

"Great care must be taken to protect the solution nitrate-silver, when prepared with iodide potassium from the light. If it is found to attack the plate, more iodide potassium must be added.

"I beg to suggest that the stop in cameras should be made to slide a little vertically; by this means distant objects might be brought out, which are now solarized or destroyed by the plate remaining exposed until near objects are well defined.

"W. J."

Proto-nitrate of iron may be obtained readily by adding sulphate of iron to nitrate of barytes in solution, or by boiling sulphuret of iron in dilute nitric acid until all the sulphuretted hydrogen is expelled, then filtering

and preserving the resultant liquid in a well stoppered bottle containing clean iron filings, keeping it from the air and in the dark.

Mr. Mayall has kindly favored us with the following formula for preparing the iodide of silver to be used with the collodion.

Dissolve a little nitrate of silver in alcohol precipitate with iodide potassium, and well wash with alcohol. Mix this in another bottle, with half a fluid ounce alcohol, and add just as much iodide of potassium as will re-dissolve it; this you may call iodide silver.

Twelve drops of the above mixture may be added to each ounce of collodion.

Excite with nitrate of silver thirty grains dissolved in one ounce of distilled water, and develop with pyro-gallic acid.

The following remarks on the preparation of collodion by M. O. Livonius are taken from the "Archiv der Pharmacie." We give them as translated for the "Chemist:"

ON THE PREPARATION OF COLLODION.

By M. O. Livonius.

The different works published for some time past on collodion, the use of which as an adhesive and glutinous agent becomes each day more general, induced me to undertake some experiments on its preparation.

I made some gun-cotton by means of fuming sulphuric and nitric acids, in different proportions; but each time the product I obtained was only partially soluble in sulphuric ether, whilst it was perfectly soluble in acetic ether. The solution in sulphuric ether possessed great adhesive properties; in the other solution, on the contrary, there was no adhesive power. The gun-cotton, which did not completely dissolve in the sulphuric ether, did so immediately on the addition of a little acetic ether; but the solution thus lost all its adhesiveness. In order to obtain a product as soluble as possible in sulphuric ether, I tried preparing the gun-cotton with nitre and fuming sulphuric acid. I took 200 parts of dry nitre, in very fine powder, and 300 parts of fuming sulphuric acid; I mixed the two substances in a porcelain capsule, stirring the mixture with a glass rod, and I added ten parts of clean dry cotton as quickly as possible. After three minutes contact, during which I continued to stir it, I washed it carefully with distilled water; I pressed the cotton and dried it at a gentle heat. The gun cotton thus obtained dissolved

better in sulphuric ether than that produced by the first process; still the solubility was not complete. Preserving the same proportions as before, I mixed the nitre with English sulphuric acid, and, after five minutes' contact, I continued the operation as above. By this method I obtained a product which dissolved readily in alcoholised sulphuric ether, and which gave me collodion with a remarkable power of adhesion, five grammes of gun-cotton stirred in 110 grammes of sulphuric ether, with the addition of twenty grammes of alcohol, gave a complete and transparent solution, of the consistence of a thick mucilage of gum.

I therefore recommend this method as one of the most economical processes that can be employed.

HYALOTYPE, OR PHOTOGRAPHY ON GLASS.

First, I take a phial of any small size, and put into it some grains of nitrate of silver and some iodide of potassium, rather in excess; then pour on the same a quantity of pure ether, which soon dissolves as much as it is able; I shake this mixture well, and leave it to rest for some hours. The nitrate of silver and iodide of potassium, not taken up in solution lie at the bottom of the bottle; apparently the ether takes up very little into solution, but quite enough for taking good pictures.

After the lapse of three or four hours, procure an ounce or two-ounce bottle and pour into it a small quantity of collodion, and then the same with the ether solution of iodide of silver, as above, trying its opacity on a piece of glass, which, when dry, should be quite transparent, and yet sufficiently impregnated with the collodion to be adhesive to the glass, to avoid being washed off in the after process.

This mixture should remain at least six or eight hours before use, after having been well mixed and shaken from time to time; but I always keep a small lump of iodide potassium in excess in this mixture, thereby maintaining the same strength throughout.

After coating the glass with the above, and before the ether entirely evaporates, I plunge it into a bath of thirty grains nitrate of silver in one ounce of distilled water, and move it about until the greasy appearance has ceased; drain it, and immediately put it into the slide of the camera which, in a clear day, with a good double lens, takes from a quarter to half a minute for a good picture. I then develop with pyro-gallic and acetic acids, as already described in papers published by various authors.

I should say, take rather an excess of time in developing; i.e., until the pyro-gallic acid becomes of quite a dirty appearance, using plenty of it on the surface to develop. This immediately washes off in water; then fix by a nearly saturated solution of hyposulphite of soda, and wash again. I may mention that, the picture, when under the influence of this last solution, appears to undergo a complete change, perceptible to the eye, as if it were completely vanishing, and reappearing under its dissolving powers.

C. J. Devey.

Handsworth, Aug. 1851.

From the Chemist.

CAMERA IMPRESSIONS ON ALBUMENIZED GLASS PLATES.

Take an ounce measure of the white of egg, add to it seven grains of iodide of potassium, and two grains of bromide of potassium; shake it up in a bottle until the whole forms one mass of froth, which will not run on the bottle being inverted. In two or three hours sufficient liquid will have separated to coat the plates. Procure a glass tube about an inch diameter and six or eight long, and tie over one end a piece of fine linen. The above albumen is then poured into this tube and forced out by blowing on the glass plate, which must first be cleaned, not with strong nitric acid, but by a few drops of spirit and a little chalk, on a piece of clean leather. The albumen is now forced through the tube on the plate, which is held horizontally on the finger. The diffusion of the liquid might be facilitated by spreading it with the edge of another piece of glass. An excess ought to be placed on a glass and made flow all over, by inclining the plate from side to side. The excess is then made to flow off at one corner into a glass, to be returned to the tube when required. The plate should not be drained much. as a thin coat is not so sensitive as a thicker. The coated plate is better put aside on a horizontal board and covered over while another is prepared in a similar manner. A square tin vessel is to be procured, of dimensions not less than two inches greater than the glass to be coated. A piece of thin plate glass is to be supported on the inside in a horizontal position, and about an inch less each way than the tin vessel. This vessel ought to have a cover in the form of a pyramid, that the steam might trickle down the sides and not drop on the prepared plate. An iron tripod-stand sufficiently high to admit a chauffer underneath, with an adjusting-screw

in each foot, is the best support, as it allows the apparatus to be levelled with the greatest nicety. When the apparatus boils,* put the glass first prepared on the middle of that which was levelled in the boiler, and place the cover on. In about two minutes the albumen is coagulated firmly, and will bear rubbing when wetted. If the plate is not kept in long enough it will be soft when wetted, and subject to all the difficulties the other processes were. If it is kept in too long it will be liable to crack, the commencement of which might be noticed around the edges, and should be the signal to remove it. The coating is best dried by leaving it in the boiler, while the cover is placed crossways over the plate to prevent dust from falling on it; the steam then escapes, and the albumen quickly dries and becomes transparent. It will be observed that in this process the coagulation takes place in an atmosphere of steam, which is essential, otherwise the thin film would dry before arriving at the necessary temperature, and coagulation would be impossible, coagulated albumen being a hydrate—a fact not mentioned before in connexion with this process, and which rendered the other published processes so difficult, the coagulation in their case being generally performed by the acetic acid of an after operation, and not by the heat. This coagulation is soft, and very difficult to obtain without lines called ripple *marks*. Prepared glass plates are best preserved in a daguerreotype-plate box. To make them sensitive, dip them into a solution of aceto-nitrate of silver, consisting of about thirty grains of nitrate to an ounce of water, and one-sixth its bulk of strong acetic acid; to which add one-eighth of alcohol. The plate is then removed and well washed in water, and placed in the camera wet or dry; in the latter case it is less sensitive. If a very sensitive plate is required, it must not be washed at all, but placed in the camera immediately, as it does not do well to allow it to dry in that state. When the exposition in camera has taken place, the picture is developed by placing the plate first in the nitrate of silver before mentioned, and then in a saturated filtered solution of gallic acid, sufficient to cover the plate. When well developed, which might be known by holding the plate up before a candle, it is desirable to wash it with cotton and water to remove any surface deposit. Strong hyposulphite must not be used for fixing, as it is liable to detach the coating from the plate, but bromide of potassium of twenty-five grains to six ounces of

* We presume Mr. R. means water to be put into the tin vessel and then made to boil.

water. The glass must be washed previous to going into the bromide of potassium, and also after.

The process which I have detailed I have carried largely into practice, and it is simple and certain in its results. I and Mr. Nichols first used the steam-bath four or five years since, but could not succeed to our satisfaction until I again turned my attention to it last spring.

THOMAS REEVES.

N.B.—Plenty of water must be kept in the boiler, and sustained briskly boiling.—*From the Expositor.*

POSITIVE PAPER FOR SCIENTIFIC PURPOSES.

To 4 grs. isinglass, dissolved in 1 oz. of distilled water, and filtered, add 12 grs. bromide potassium and 8 grs. iodide potassium.

This solution is laid evenly over the paper and dried at a fire; when to be used, wash with a solution of nitrate silver, 50 grs. in 1 oz. of water and about 1 dram of acetic acid.

After exposure in camera, wash with saturated solution of gallic acid and a few drops of acetic acid.

This paper improves by being kept in the dark for an hour or two after the silver solution is put on.

This process is used at the Greenwich observatory for registering *meterological observations*, it will be found very useful for such purposes.

GLASS PICTURES, NEGATIVE AND POSITIVE.

Mr. H. Huck, of Holme, in a letter addressed to the publishers and dated 1st May, 1849, gives the following process for photographs on glass :—

"According to promise I forward to you the process. In the first place I take a plate of glass that will stand the fire, and then cover it with leaf silver and fix it by heat same as common glass silvering; I then polish the silver and take a daguerreotype impression according to the common method; I then attack the picture with the following acid :—water 150 parts, nitric acid 11 parts, solution of nitrate potash 3 parts, solution of common salt 11 parts, mix these and cover the plate with this acid which soon drives out the blacks of the picture and leaves you a transparent negative picture which can be used for copying positive pictures from them. By colouring the picture on the silvered side you obtain a picture, the silver representing the whites same as a painting on glass."

In concluding the second part of this Manual the editor cannot refrain from congratulating the Amateurs of Photography on the present state and prospects of their favourite art. Difficulties which seemed insurmountable have been vanquished, and each day sees some new development of powers which seemed at first feeble and limited. It is difficult indeed to say in what direction modern research can be best applied to the investigation of the Phenomena involved in these processes; one thing, however, it would be most desirable to accomplish, the discovery of a substitute for the costly silver solutions now used. In rapidity and decision of operation, the recent experiment of Mr. Talbot shewing that really instantaneous action can be produced, at least on the daguerreotype plate, and the proofs of moving objects produced by the Collodion process, leave little or nothing to be desired. Even the long debated question of the re-production of the natural colours by the agency of light seems on the point of solution, two claimants for the discovery being already in the field: Mr. Hill, of America, whose claims, however, rest pretty much on his own assertions, very few persons pretending to have seen any specimens of his invention, and Mr. Niepcé, de St. Victor, from whose well known character, as an experimental philosopher, much might reasonably be expected, and who has forwarded to London, as we understand, specimens of proofs in which every colour is re-produced with a vigour and richness truly wonderful. The year of the Great Exhibition will therefore probably be farther graced by the promulgation of a process which brings the science of Photography very near to perfection. The display of Photographs in the Crystal Palace s certainly not behind that of any other branch of industry or art exhibited there, and is peculiarly illustrative of the energy and peseverance of our countrymen amidst discouragements from which our foreign friends are exempt. While speaking of the Exhibition, we must not omit noting a new application of this art in the Heliotype, in which pictures taken on glass are again received upon glass to form slides for the magic lanthorn. The extreme faithfulness and exquisite delineation of these must be seen on a large scale to be duly appreciated; and we have here, a means of viewing the very reflections of nature or art in all their natural proportions of beauty and grace. Who shall put a limit to the pleasures yet to be derived from the skilful direction of the pencil of nature?

* COMPARATIVE TABLE OF ENGLISH AND FRENCH WEIGHTS AND MEASURES.

	Grains.
1 Pound Avoirdupoise	7000
1 Ounce ditto	437.5
1 Pound Troy	5760
1 Ounce ditto	480

Gramme	15.4063
Decigramme	1.5406
Centigramme	0.1540
Milligramme	0.0154

	Inches.
Yard	36
Metre	39.37079
Decimetre	3.93708
Centimetre	0.39370
Millimetre	0.03937

	Cubic Inches.	Grains of Distilled Water.
Imperial Gallon	277.274	70000
Ditto Pint	34.65925	8750
Ditto Ounce	1.7329625	437.5
Cubic Inch	1.	252.458
Litre	61.02525	15400.312
Decilitre	6.10252	1540.631

* These Tables are copied from Faraday's Chemical Manipulation.

TABLE OF CONTENTS.

CATALOGUE

OF

PHOTOGRAPHIC APPARATUS,

Chemical Preparations & Materials,

MANUFACTURED AND SOLD BY

THOS. & RICHD. WILLATS,

OPTICIANS AND PHILOSOPHICAL INSTRUMENT MAKERS,

28, IRONMONGER LANE,

(REMOVED FROM 98, CHEAPSIDE,)

LONDON.

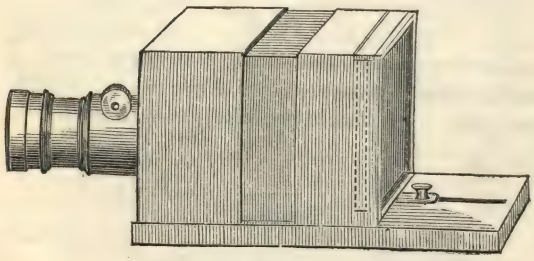

Fig. 1.

	£	s.	d.
Improved French Pattern Shifting Back Camera, with achromatic lens, 3 in. in diameter, mounted in brass sliding tube, with diaphragms to take pictures 10 by 8 in. . fig. 1	10	0	0
Ditto ditto with rackwork adjustment & double slide, Fig. 2, to hold two prepared papers . . .	11	0	0
Ditto ditto with Lerebour's triple combination lenses to take Pictures 8½ by 6½ in. or whole plate . . .	14	14	0

	£	s.	d.
Improved French Pattern Shifting Back Camera, with double combination lenses and diaphragms to take 6½ by 4¾ in.	10	10	0
Ditto ditto with double combination lenses to take pictures 4 by 3 in.	5	16	0
Ditto ditto with single achromatic lens, rackwork adjustment to take pictures 6 by 7 in.	4	10	0
Ditto ditto with single achromatic lens to take pictures 5 by 4 in.	2	10	0

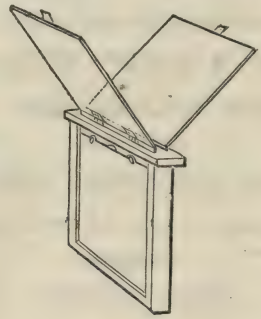

Fig. 2.

Photographic Camera, with brass sliding front and miniscus lens for obtaining pictures on paper, 4 by 4 in.	1	1	0
Ditto ditto with brass sliding front and achromatic lens	1	5	6

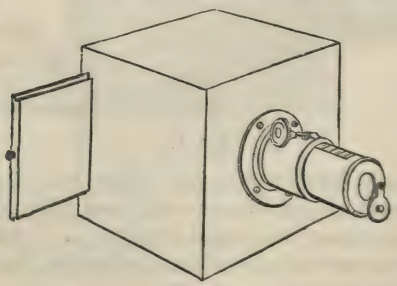

Fig. 3.

Photographic Camera, of best construction, with rackwork adjustment and achromatic lens fig. 3, from £1 15s., to	2	2	0

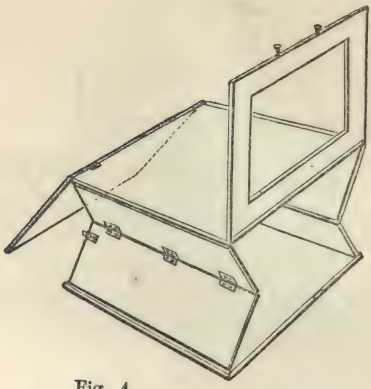

Fig. 4.

	£	s.	d.
Folding Cameras with single achromatic lens fig 4 from	4	4	0
Ditto ditto, made to order, to suit lenses of various focal lengths.			

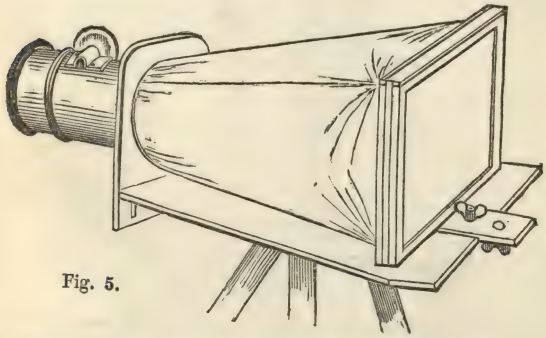

Fig. 5.

	£	s.	d.
R. Willats' Improved Portable Camera with flexible body, angular, vertical, and horizontal adjustments, with achromatic lens and rackwork front to take pictures, 10½ by 8 in. . . . . fig. 5	11	11	0
Ditto ditto without angular adjustment and sliding tube .	9	9	0

This form of Camera, shown at the Exhibition of 1851, is so constructed as to admit of being packed into a very small space and extremely convenient for Travellers, being easily carried and not liable to derangement.

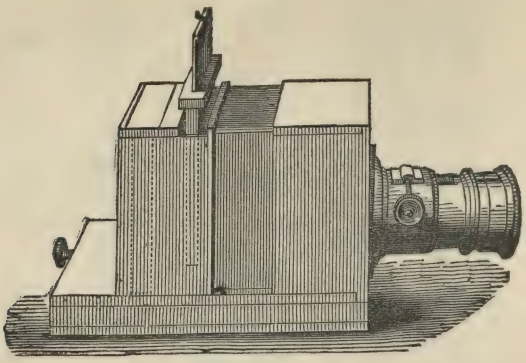

Fig. 6.

	£	s.	d.
*Willats' Improved Camera with double achromatic combination lenses to take pictures, 4 by 3, adapted for portraits, with screw adjustment . . fig. 6	6	0	0

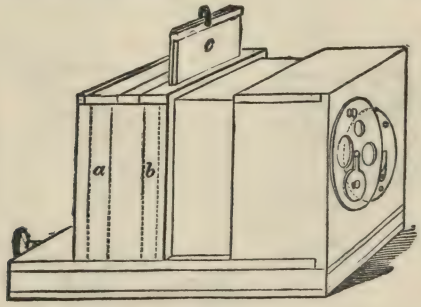

Fig. 7.

*Willats' Improved Camera, with single achromatic lense and revolving diaphragm to take pictures 4 by 3, 3¼ by 2⅝, and 2½ by 2 . . . . fig. 7	3	10	0
Cundell's Camera, with single miniscus lens . .	3	3	0
Ditto ditto, with double combination of miniscus lenses, to take a picture, 7¼ by 6¼ in., as described in the Philosophical Magazine	5	5	0

* These forms of Camera are well adapted for taking portraits by the collodion process.

	£	s.	d.
Hazell's Improved Photographic Camera with self-acting back mounted with achromatic lens in sliding front from	4	4	0
Complete sets of Photographic apparatus, including chemicals and apparatus for paper or glass, in case, to take pictures 4 by 4 in.	3	3	0
Ditto ditto in stout packing case, with lock and key, to take pictures 5 by 4 in.	5	5	0
Ditto ditto to take pictures 6 by 7 in.	8	8	0

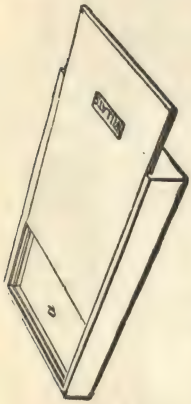

Fig. 8.

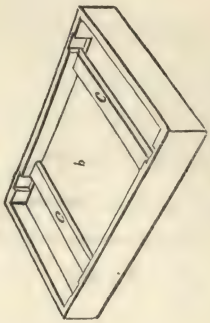

Fig. 9.

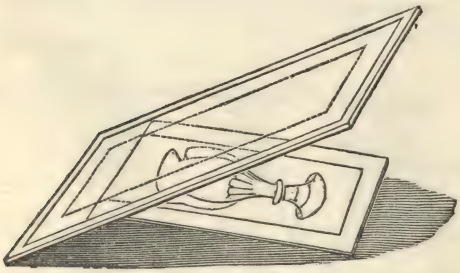

Fig. 10.

Copying frames and glass for obtaining positive photographs from 0 5 6

	£	s.	d.
Copying frames and glass for obtaining positive photographs with padded backboard and pressure bars . from	0	7	6
Ditto ditto with sliding lid for ditto . fig. 1	0	10	6
Johnstone's Improved ditto, with hinged back, so that the progress of the process can be conveniently viewed without disturbing the papers . fig. 10, from	0	16	0

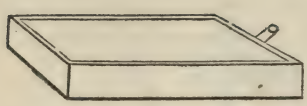

Fig. 11.

Fig. 12.

Tin vessels for heating photographic drawings fig. 11, 3s. &	0	5	0
Photographic Etnas . . . fig. 12, each	0	5	6
Porcelain Pans for washing and setting pictures . 1s. 6d. &	0	2	6
Extra large ditto, 12 by 10 inches . . .	0	4	6

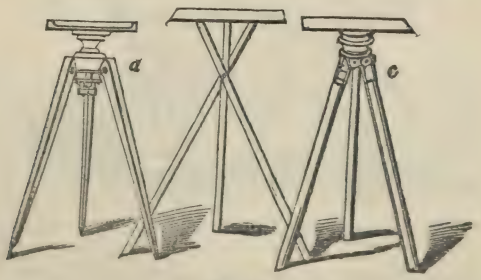

Fig. 13.

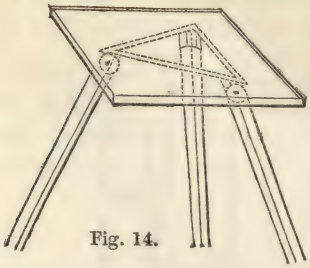

Fig. 14.

	£	s.	d.
Camera Stands . . . fig. 13, *a*	1	16	0
Ditto ditto, jointed legs . . .		2	0
Portable ditto ditto . fig. 14, 16s., 21s., &	1	6	0
R. Willat's Improved Ball and Socket Tripod Camera Stand, very portable, and by a new and simple arrangement of the screw & wedge, the ball can be firmly clamped, capable of holding a heavy camera without liability of shifting	2	10	0
Head rests, best portable	0	7	6
Johnstone's Improved Head rest . . .	1	7	0
Improved Camel's Hair Brushes prepared expressly for Photographic purposes . . . round	0	1	0
Ditto ditto . . . . flat	0	1	6
Ditto ditto larger sizes . . 2s. 6d. &	0	3	6
Glass Tube with silver wire for Buckle's cotton wool brush .	0	2	6

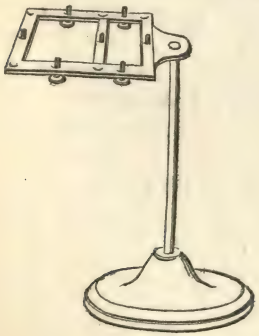

Fig. 15.

Fig. 16.

		£	s.	d.
Tripod Stands or levelling stands . .	fig. 16	0	5	6
Best ditto ditto	fig. 15	0	10	6

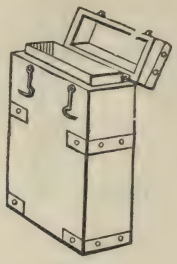

Fig 17.

Boxes of various sizes for holding glass plates, price according to finish

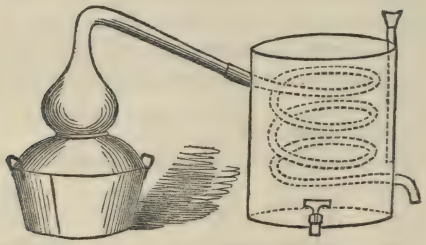

Fig. 17.

		£	s.	d.
Portable still, with worm and tub for the distillation of water on common fire . .	fig. 17, 1 gallon	1	1	0
Ditto ditto, best make		1	5	0
Ditto ditto, best make . .	2 gallons	2	0	0
Turner's superior Paper, made expressly for photographic purposes . . .	per quire	0	4	0
Ditto ditto . . .	quarto	0	2	0
Whatman's (selected) . .	per quire folio	0	5	0
Ditto ditto . . .	quarto	0	2	0
French Photographic Paper . . .		0	4	0
Stout White Wove Blotting Paper . .		0	1	6
Pink ditto ditto		0	2	0
Plate Glass Slabs of various sizes .	1s., 2s., 3s &	0	5	0
Glass Spirit Lamps . . .	2s. 6d., 3s. 6d. &	0	5	0

	£	s.	d.
Flat Glass Cells for giving sensitive coating . from	0	2	6
Shallow Glass Troughs of various sizes . . .			
Glass Tubes for Reeves' Albumen Process . .	0	0	6
Steaming Apparatus for ditto ditto, made to order .			
Porcelain Evaporating Dishes . . . 9d. &	0	1	0
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Ditto ditto, unbleached for making Gun Cotton per lb.	0	2	6
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Mastic Varnish . . . per bottle	0	1	0
Thermometers . . . . from	0	2	6
Retort and Receiver Stands, glass retorts, receivers and flasks, &c.			
Glass stoppered Bottles for holding chemical preparations of various sizes . . from each	0	0	6
Glass Funnels and Stirring Rods . . .			
Graduated Glass Measures . . . 1s. 4d. &	0	1	6
Mortars and Pestles			
Scales and Weights, common	0	3	6
Ditto ditto, glass pans, best	0	18	0
Pipettes . . . . . 6d. &	0	0	8
Selected Glass for Negative Photographs cut to any size.			
Tin Plate for waxing proof . . . 6d. &	0	1	0

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—— Gallic, pure . . . . ,,	0	5	0
—— Pyro-Gallic . . . . per dram			
—— Succinic, pure . . . . per oz.	0	4	6
—— Hydrochloric, pure . . . ,,	0	0	2
—— Sulphuric pure . . . ,,	0	0	2
—— Nitric pure . . . . ,,	0	0	3
—— Nitro-Muriatic . . . per oz.	0	0	4
Ammonia Solution . . . per oz., 2d. &	0	0	3
——— Hydrochlorate, pure . . .	0	0	6
Copper Sulphate . . . . per oz.	0	0	3
Collodion . . . . . ,,	0	1	0
Archer's Prepared ditto . . . ,,	0	1	3
Arsenicated ditto as Page 37 . . . ,,	0	1	4

		£	s.	d.
Rectified Sulphuric Ether		0	1	0
Acetate of Lead	per oz.	0	0	3
—— of Lime	„	0	0	6
Baryta Hydrochlorate	„	0	0	6
Salt of Gold or Sel D'or	per bott.	0	5	0
Iron Ammonio Citrate	per oz.	0	1	0
—— Sulphate, pure		0	0	2
—— Proto Nitrate Solution				
Syrup of the Iodide Iron	„	0	1	6
Lime Cloride, pure	„	0	0	6
Potassium Bromide, pure	„	0	5	0
——— Ferro Cyanuret, Pure	„	0	0	6
——— Ferro Sesquicyanuret	„	0	2	6
——— Fluoride	„			
——— Cyanide	„	0	1	0
——— ——— Pure	„	0	3	6
——— Iodide, Pure	„	0	3	0
——— Cupreous Cyanide Solution	„	0	1	0
——— Nitrate pure	„	0	0	3
Silver Nitrate Pure, crystalised	„	0	5	6
—— Potassio Cyan Silver Solution	„	0	1	6
—— Oxide	„	0	8	0
—— Herschel's Solution Ferro Tartrate	„	0	4	0
Soda Hyposulphate	per lb.	0	3	0
—— ———	per oz.	0	0	3
—— Chloride, pure	„	0	0	6
Virgin Wax	per oz.	0	0	4
Distilled Water	per gall.	0	1	0
Pure Gelatine		0	0	6
Sugar of Milk				
Willats's Preparation for making Iodized Paper by one application or wash	per bott.	0	2	6

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We have already alluded to Mr. Niepcé de St. Victor's production of coloured pictures which is understoood to be very complete and effective in cases where time is not a necessary element of the experiment. To portraits or views it is at present inapplicable, but the talent and determination of Mr. Niepcé will, there can be no doubt, overcome all difficulties, and perfect a process which resolves, as we have already hinted, the most interesting problem in photography. Those of our readers who may wish to possess full information on this subject are referred to Mr. Niepcé's own Memoirs, presented to the French Academy. We have only room for a very brief notice of the experiment.

In reflecting upon a discovery of Mr. Edmond Bequerel by which a plate became susceptible of coloration, Mr. Niepcé was led to think that an analogy might exist between the color given to flame by certain bodies, and the colour produced upon the plate of silver when treated with chloride of sodium by the method of Mr. Bequerel; further examination seems to have convinced him that his idea was well founded, and by following it out he has been able to produce copies of colored prints in very beautiful and lively tints. He found that a chloride of strontian gave the red tints very decidedly just as that preparation thrown into burning alcohol produces coloured flames: so for the yellow with chloride of calcium or uranium, for the green with boracic acid, chloride of nickel or the salts of copper, the blue with the double chloride of copper and ammonia, violet with chloride of strontian and sulphate of copper. Those substances which will not colour flame, or which only give white flame, will yield no colour by the action of the sun's rays. By adding a salt of copper to liquid chlorine a very sensitive surface is obtained by a single immersion, but the result is seldom good. Mr. N. prefers the

dento-chloride of copper to which he adds three or four pounds of water; but a mixture of equal parts chloride of copper, and chloride of iron is still more satisfactory. A bath composing those substances which produce all the colours would produce the most lively pictures, but there is great difficulty in putting the proper proportions, or some colours may be excluded by others. Taking one-fourth of the chloride by weight, and three-quarters of a pound of water; or if muriatic acid be used with a salt of copper one-tenth of a pound water, a very pure surface of silver carefully cleaned with Tripoli powder and ammonia is connected with the positive pole of a galvanic battery, and plunged into the solution and kept there for some minutes. The only certain way of producing a surface of chemically pure silver, is by the use of a battery as explained in the "Manual of the Electrotype," published by Messrs. T. & R. Willats. The plate is then taken from the bath, washed in much water, and dried by a spirit lamp; the surface produced is of a dull neutral tint often almost black, and on exposing it to the light the colours are produced by removing the blackness; the surface is in fact etched out in colours. The sensibility of the plate is increased by heating it over a lamp until it becomes of a cherry red color on the surface. The plates cannot be rendered very sensitive, indeed two or three hours are now required to produce a decided effect in the camera: already, however, the fluoride of sodium has been found to accelerate the operation. These images cannot yet be said to be permanently fixed. Iodine and bromine, or their salts will not produce colors upon the plate. Mr. Niepcé has also failed in producing any effect upon paper by this method. We await with some anxiety the result of his further experiments and cannot but admire the zeal which had led him to undertake them andthe readiness and liberality with which their results are communicated to the world. Imperfect as the process now is it may be of considerable service in producing coloured pictures of still life, fruits, and flowers, the pictures, when varnished and kept from a strong light, being tolerably lasting and very beautiful.

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